GPRS-1 / GPRS -1-B / GPRS -1-O / GPRS -1-N

OPERATIONS & MAINTENANCE MANUAL

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1. Introduction

The General Packet Radio Services (GPRS) is a packet oriented mobile data service for GSM and TDMA networks. GPRS modems use wireless cellular technology and provide data access in most areas where a typical cell phone works. US Domestic service is provided by TMobile. International service is offered in 130 countries. Different rate plans are available based on the location of the modem and how much data you need to send

Sutron's GPRS-1 is a GSM / GPRS data transceiver that provides two-way communication with remote equipment. It can be integrated into many Sutron loggers including the Monitor, 8310 and Xpert. In addition it also supports a digital voice interface and 2 ADC (Analog to Digital Converter) channels and one DAC (Digital to Analog Converter). Typical SMS messages range in size from 1 to 160 bytes. GPRS-I can also send longer messages by splitting the long message into multiple shorter messages. Sutron has a number of plans with a low cost charge per byte making it affordable to add communications to most any remote station with GSM/GPRS coverage.

With its small size, GPRS-I can fit inside most any product. Sutron also offers a variety of antenna and cabling to use with the GPRS-1.

This document will guide the user through the steps to install and use the *GPRS-1* with Sutron data loggers, as well as provide some troubleshooting when problems occur.

Features

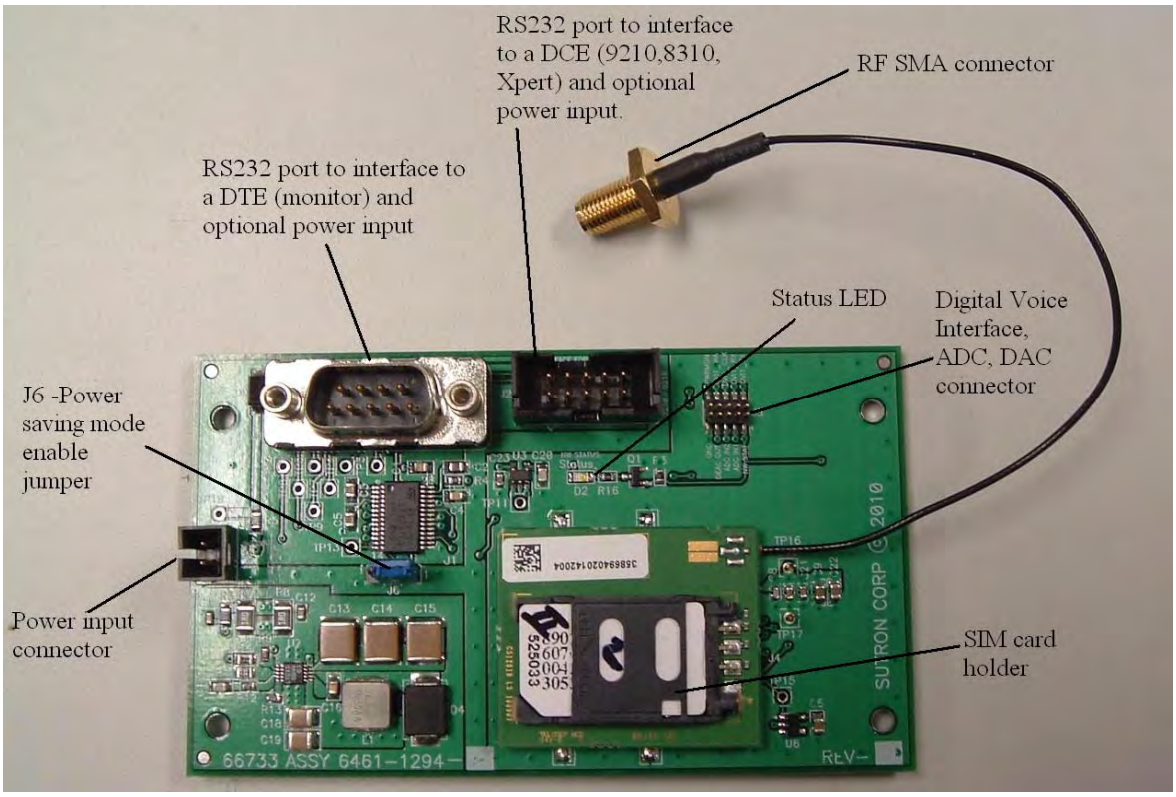
- 2 way communication wherever GPRS/GSM coverage is available
- Fully integrated into many Sutron loggers
- Data delivered via SMS/FAX
- Digital voice interface, DAC, ADC
- Low cost data plans available from Sutron
- Web hosting available from Sutron
- Multiple power input options via a 2-pin power connector or a single RS-232 port for data and power
- LED to indicate idle, standby and network connectivity status.
- Two-way communications – collect data and make remote changes
- Small equipment size – fits in tight spaces
- Small antennas – easy to conceal

2. Quick Start

Unpacking

Remove the GPRS-1 / GPRS-1-B / GPRS-1-O / GPRS-1-N unit from the shipping container and visually inspect the unit for signs of damage during shipment. Report any such damage to the factory immediately to ensure a prompt response and resolution. Retain one shipping container in the event a factory return is necessary.

Please note that if a return is required, a return material authorization (RMA) number is required. To get this RMA number, call the Sutron Customer Service Department at 703 406 2800.


RS232 port to interface to a DCE (9210,8310, Xpert) and optional power input.
RF SMA connector
RS232 port to interface to a DTE (monitor) and optional power input
Status LED
Digital Voice Interface, ADC, DAC connector
J6 -Power saving mode enable jumper
Power input connector
SIM card holder
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66733 ASSY 6461-1294
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Figure 1- Interior showing all relevant parts.

Hardware description

This section describes the various connections for power input, Power saving mode onfiguration and data communication with the modem. The modem is based on Telit's robust GC864-QUAD GSM/GPRS module. A detailed description of the various functionalities and AT commands can be found on Telit's GC864-QUAD product page.

Power

The modem requires a dc power supply in the range of 8-20v for proper functioning. Power can be applied either to pin # 2 of the 2-pin power input connector or pin # 9 of the DB9 connector or pin # 8 of the shrouded 2x5 connector. The pin configurations for different power input options are illustrated in figure 2. . If the modem is powered by the 9210/ Xpert/ 8310 through the DB9 connector please ensure that the jumper settings on the data logger are appropriately configured to output 12v.

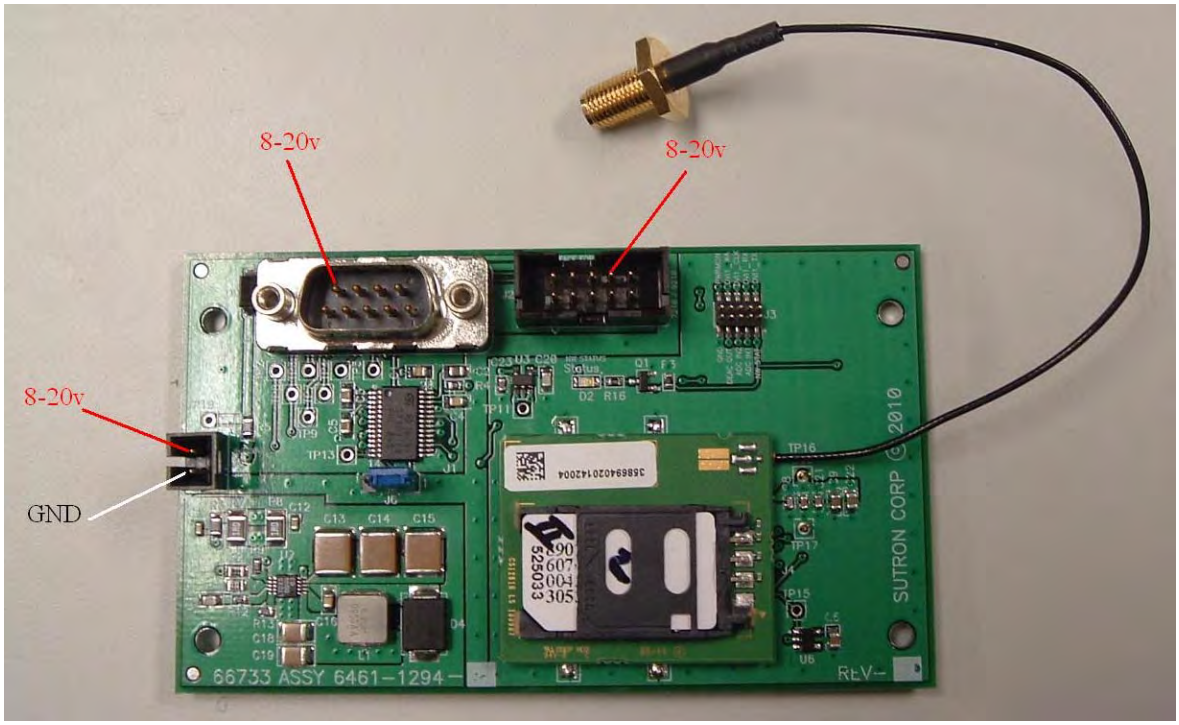

Figure 2 – Power Input Options

RS232 Connection

The transceiver interfaces with the outside world using the standard RS232 protocol. A standard DB9 (Figure 3) connector is provided for interfacing with DTE devices like a PC, SDR or Monitor.

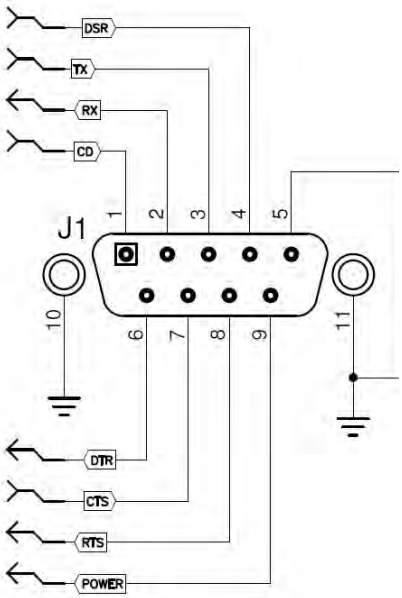

Figure 3: DB9 connector pin out

Alternately the transceiver can directly interface with a DCE (9210, XPert, 8310) via the 2x5 shrouded connector (Figure 4).

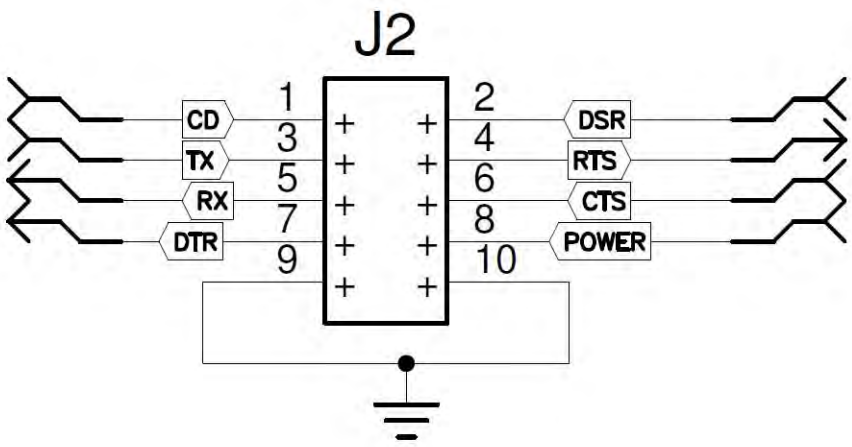

Figure 4 – 2x5 Shrouded connector pin out

Figure 5 shows a cable adapter (Sutron part # 6411-1524-1) that can be used to interface with a 9210/Xpert or 8310.

Figure 5 – Cable adapter to interface with a 9210/Xpert/8310

Power saving mode enable jumper

Jumper J4 can be used to configure the modem to enter a *power saving* mode whenever DTR is not asserted or always stay ON regardless of the status of the DTR pin.

Jumper position	Description
1-2	DTR controls modem power saving mode. Use this option only if DTR is will be asserted by the Host.
2-3	The modem never enters power standby mode regardless of status of DTR

The modem supports a number of power saving modes which can be configured via simple AT commands. Please refer to Telit's AT Commands Reference Guide for a detailed description regarding configuration. One of the most commonly used modes is the *mobile full functionality with power saving mode enabled* (AT+CFUN=5). In this mode, if DTR is not asserted, the power consumption during idle time is reduced thus increasing battery capacity. The power saving mode however does not affect the network behavior of the modem. Even during the power save condition, the module remains registered on the network and is reachable for incoming calls or SMS. In the *full functionality with power saving mode*, the modem will send

incoming SMS and call notifications (as per configuration settings) to the host even though DTR is not asserted, however the host will have to assert DTR for the modem to enable CTS.

Status LEDS

A Green status LED has been provided to facilitate easy and quick indication of the modem status. The blink frequency and duration indicates Network service availability. For hardware monitoring of the network status the signal is also available on Pin #1 of the expansion connector (J3).

LED status	Description
Permanently off	Device is off.
Fast blinking (Period 1s, Ton 0.5s)	Net search / Not registered / turning off
Slow blinking (Period 3s, Ton 0.3s)	Registered full service
Permanently on	A call is active

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Antenna

A GPRS/GSM antenna must be connected to the RP-SMA female connector provided with the modem. This device is to be used only for mobile and fixed application. The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

Parameter	Value
Impedance	50 Ohms nominal
Frequency range	Depending by frequency band(s) provided by the network operator, the customer shall use the most suitable antenna for that/those band(s)
Bandwidth	70 MHz in GSM850, 80 MHz in GSM900, 170 MHz in DCS & 140 MHz PCS band
Gain	Gain < 3dBi
Input power	> 2 W peak power
VSWR absolute max	<= 10:1
VSWR recommended	<= 2:1

Activation / Data plans

The first step to using GPRS is to find out if your area has GPRS cell coverage. For US domestic markets, go to http://www.t-mobile.com/coverage/pcc.aspx . Click on the tab for "Data Coverage". The areas colored grey and magenta have coverage – the areas in white have no coverage. If your area has coverage, you'll be able to use Sutron's standard SIM card in the modem. For areas outside the US, contact Sutron for up-to-date coverage information.

GPRS communications is very affordable and Sutron offers several rate plans to choose from. Unbundled plans allow pooling of data between stations at higher costs per MB. Unbundled plans do not allow pooling but are on a per station (or SIM card, the card that identifies the modem to the system) basis. The unbundled plans offer the lowest costs when you have lots of stations that send small amounts of data. The plans are best chosen based on your expected monthly usage. You do not need to put all the stations on the same plan.

Setup

Connect the transceiver as indicated above. Ensure that the antenna connector is snuggly tightened. Also ensure that unit is powered either by the host through a RS232 port or through the 2-pin external power connector. The modem is configured at the factory for auto-baud mode (baud rate, stop bit and parity are automatically detected by the modem).

After turning on the power the Green LED will initially blink at a fast pace, indicating that the modem is not registered and is attempting to join a network. This phase usually takes a few seconds, after which the green LED should start blinking slowly to indicate that the modem is registered and ready for operation. Please refer to the Status LED section above for a detailed description.

Testing communication

Connect the transceiver to one of the COM ports of the data logger (9210, Xpert, 8310).Use a terminal tool like hyper-terminal (default = 115200 baud, 8 data bits, No Parity, 1 stop bit, no hardware handshaking.) to communicate with the data-logger. Once connected to the logger will display a prompt **\Flash Disk>** to indicate that it is ready. All commands must be terminated with a carriage return character (Enter Key). Send a command "**Passthru COM2:38400**" to bypass all commands to directly to the transceiver. Please note, if using a different COM port use the appropriate COM port number in the **Passthru** command. The logger should respond with "**Passthru operation has begun (press ESC ESC ESC to abort)**" to indicate that it has successfully initiated bypass mode and issue command the commands from the table below in the sequence listed.

GSM Network test

Command	Expected Response	Notes
AT	OK	If the transceiver does not respond, ensure that the orange LED is ON else DTR is not being asserted by the host.
AT+CSQ	+CSQ:<rssi><ber>	If rssi = 0 or 99, check antenna connection, move to an open space with unblocking view of the sky.
AT+CREG	+CREG:<status>	status: 0 – not registered, modem is not currently searching a new operator to register to 1 – registered, home network 2 – not registered, but modem is currently searching a new operator to register to 3 – registration denied 4 –unknown

		5 – registered, roaming
AT+CMGF=1	OK	Set the SMS mode to text format.
AT+CNMI=2,2	OK	Configure incoming message indication to be directly sent to the host
AT+CMGS=xxxxxxxxxx	>	Send a SMS message to number xxxxxxxxxx. To enable a complete test the modem should send a SMS to itself (destination address = sender's address).
Test Message To test GPRS Modem<CTRL-Z>	+CMGS: ccc +CMT: "+xxxxxxxxxxx","","yy/mm/dd,hh:mm:ss-ll" *Test Message To test GPRS*	This is the actual SMS message to send. The text SMS should be terminated with character CTRL-Z (0x1A) ccc=outgoing message counter In the received SMS xxxxxxxxxxx = source address yy/mm/dd,hh:mm-ss = arrival time. *Test Message To test GPRS* = SMS message received back

3. Troubleshooting and Maintenance

Troubleshooting

The following checklist will help in troubleshooting problems:

Problem	Possible Cause/ solution
Green LED is blinking rapidly.	Check Antenna connection. Move to an open place to ensure that the antenna has unobstructed view of the sky Ensure that the SIM card is inserted and snuggly locked into place. Ensure that the SIM card has been activated.
No response from transceiver	Power save enable jumper is set to save power mode and DTR is not asserted. Ensure that correct baud rate is set and that the correct connector (DB9 or 2x5 shrouded) is being used.

Maintenance

Maintenance of the unit should be performed at regular intervals which are dependent upon the conditions of use. Typical maintenance for the unit consists of checking the wiring to make sure it is not corroded or frayed and examining the unit to ensure that there is no physical damage.

Appendix A – Specifications

Mechanical	
Dimensions	4.00” x 2.35” with mounting holes 1.7”x3.625”
Weight	60gms
RS232 Connector	DB9 M (DCE) and 2x5 Shrouded, 0.1 inch spacing
Antenna Connector	SMA Female
Power Connector	pin 9 of RS232 or 2 pin molex
Enclosure	optional

Electrical	
Input Voltage	8v-20VDC @0.65 amp max
Power Consumption @12v	Avg During Tx – 40 mA Idle (Connected to Network) – 3 mA
Status LED	Green – Network status

GPRS Transceiver	
FCCID	TBD
Frequency	Quad-Band EGSM 850 / 900/ 1800 / 1900 MHz
Output power	Class 4 (2W) @ 850/900 MHz Class 1 (1W) @ 1800/1900 MHz
SMS	• Point to Point (mobile originated and mobile terminated) • Concatenated SMS • SMS cell broadcast • Test and PDU mode
Circuit Switched Data Transmission	• Asynchronous transparent circuit switched data (CSD) up to 14.4 kbps • Asynchronous non-transparent CSD up to 9.6kbps.
GPRS data	• GPRS class 10 • Mobile station class B • Coding scheme 1 to 4 • PBCCH support
Additional Features	• SIM holder • Fixed dialing number • Embedded TCP/IP stack Including TCP, IP, UDP, SMTP, and FTP protocols • Digital Voice Interface • 2 Analog to digital converters • 1 Digital to Analog converter • Power Monitor output • Fax (Group 3, 1)
Max SMS send/ receive size	160 chars

Environmental	
Operating Temperature	-40 to +85°C

Ordering Information

Transceiver	
GPRS-1	GPRS TX/RX, no enclosure
GPRS -1-B	GPRS -1 with panel bracket
GPRS -1-O	GPRS -1 with non-NEMA enclosure
GPRS -1-N	GPRS -1 with NEMA enclosure (available 2011)

Service	
USUB.MON	GPRS, US Unbundled service, 1 month
USUB.1MB	GPRS, US Unbundled service, 1MB pooled
USB500K	GPRS, US Bundled 500K service, 1 month
USUB500K.1MB	GPRS, US Bundled 500K plan, 1MB add'l data
USB15M.MON	GPRS, US Bundled 15MB service, 1 month
USB15M.1MB	GPRS, US Bundled 15MB plan, 1MB add'l data
USBUNL-MON	GPRS, US Bundled Unlimited service, 1 month
SMS.30	SMS, 30 messages a month
SMS.100	SMS, 100 messages a month
SMS.400	SMS, 400 messages a month
SMS.1000	SMS, 1000 messages a month
SMS.UNL	SMS, Unlimited messages a month
SMS.1MSG	Charge for each message over planned amount
SWIN-ASetup	SutronWIN Account setup
SWIN-SSetup	SutronWIN Station setup
SWIN-CPage	SutronWIN Custompage
SWIN-StnHostDay	SutronWIN
IRID.SAct	IRIDIUM, Station Activation
IRID12K.1	IRIDIUM, 12K bytes per month, 1 month
IRID.XB1000	Charge for 1000 bytes over allotted amount
IRID.MC	IRIDIUM, Mailbox checks when not transmitting data (1 free per day)

GPRS Accessory Equipment	
1291-1028	Swivel Antenna with 5dBi gain
TRAB821/18503P	Dual band cellular/PCS Antenna Cellular - 821-896 MHz PCS - 821-896 MHz
CAF825	Quad Band Omni Directional Antenna
LL400-15-S-T	Antenna Cable, LL400, 15 feet, SMA-TNC
LL400-15-N-T	Antenna Cable, LL400, 15 feet, N-TNC
LL400-20-S-T	Antenna Cable, LL400, 20 feet, SMA-TNC
LL400-20-N-T	Antenna Cable, LL400, 20 feet, N-TNC
6411-1524-1	DB9-Male to 2x5 Header adapter cable.

Appendix B – Sutron Customer Service Policy

CUSTOMER SERVICE POLICY

Dear Customer:

Thank you for making the important decision to purchase Sutron equipment. All Sutron equipment is manufactured and tested to the highest quality standards as set by Sutron's Quality Assurance Department. Our Customer Service Representatives have years of experience with equipment, systems, and services. They are electronic technicians with field and applications experience, not just with a technical background.

Customer Phone Support

Customer Service Representatives routinely handle a wide variety of questions every day. If questions arise, please feel free to contact me or one of the Customer Service Representatives. We are available from 8:00 am to 5:00 pm Monday through Friday and will be happy to take your call.

We can answer most sensor and interface questions on the first call. If we cannot quickly answer a question on an interface, we will work with you until we find a solution.

Sometimes a problem is application related. Although we pride ourselves on handling 95% of application related questions over the phone, we maintain constant contact with our Integrated Systems Division and Engineering Division for additional assistance.

Introductory Training

Training is an important part of the Sutron Customer Service philosophy. The Sutron training policy is simple---If you buy Sutron equipment, you get Sutron training! Without the proper training, you cannot take advantage of the benefits and advantages that Sutron equipment provides. We often supply on-site introductory training at your facility for no charge. You provide the classroom, students, equipment, and coffee---we'll provide the instructor.

On-Site Visits

Of course not all problems can be fixed over the phone. Sometimes a customer needs an on-site technician to identify site related problems or troubleshoot a network. Sutron can provide these services at a reasonable cost. Call for details. If you would like to learn more about Sutron products email sales@sutron.com

Thanks again for your order,

Paul Delisi
Customer Service Manager
Sutron Corporation

Appendix C– Commercial Warranty

Sutron Manufactured Equipment

THE SUTRON CORPORATION WARRANTS that the equipment manufactured by its manufacturing division shall conform to applicable specifications and shall remain free from defects in workmanship and material for a period ending two years from the date of shipment from Sutron's plant.

Sutron's obligation under this Warranty shall be limited to repair at the factory (22400 Davis Drive, Sterling, VA 20164), or at its option, replacement of defective product. In no event shall Sutron be responsible for incidental or consequential damages, whether or not foreseeable or whether or not Sutron has knowledge of the possibility of such damages. This warranty shall not apply to products that have been damaged through negligence, accident, misuse, or acts of nature such as floods, fires, earthquakes, lightning strikes, etc.
Sutron's liability, whether in contract or in tort, arising out of warranties or representations, instructions or defects from any cause, shall be limited exclusively to repair or replacement parts under the aforesaid conditions.
Sutron requires the return of the defective electronic products or parts to the factory to establish claim under this warranty. The customer shall prepay transportation charges to the factory. Sutron shall pay transportation for the return of the repaired equipment to the customer when the validity of the damage claim has been established. Otherwise, Sutron will prepay shipment and bill the customer. All shipments shall be accomplished by best-way surface freight. Sutron shall in no event assume any responsibility for repairs or alterations made other than by Sutron. Any products repaired or replaced under this warranty will be warranted for the balance of the warranty period or for a period of 90 days from the repair shipment date, whichever is greater. Products repaired at cost will be warranted for 90 days from the date of shipment.

Non- Sutron Manufactured Equipment

The above Warranty applies only to products manufactured by Sutron. Equipment provided, but not manufactured by Sutron, is warranted and will be repaired to the extent of and according to the current terms and conditions of the respective equipment manufacturers.

Repair And Return Policy

Sutron maintains a repair department at the factory, 22400 Davis Drive, Sterling, VA 20164. Turn around time normally ranges from 10-30 days after Sutron receives equipment for repair. **Call Customer Service at (703) 406-2800 for a Return Material Authorization (RMA) number.** Return the defective equipment to the factory, transportation charges paid.

Extended Warranty and On-Site Maintenance

Extended warranty and on-site maintenance contracts are available. Price quotations may be obtained from Sutron customer service representatives.